

### **Listing of Claims:**

1. (Currently Amended) ~~Method~~—A method for manufacturing a diamond film using a pulsed microwave plasma, in which, in a vacuum chamber, a plasma of finite volume is formed near a substrate by subjecting a gas containing at least hydrogen and carbon to a periodic pulsed discharges, ~~which has a~~ forming a repeated succession of a low-power states and a high-power states, and having a peak absorbed power  $P_C$ , so as to obtain at least carbon-containing radicals in the plasma and to deposit the said carbon-containing radicals on the substrate in order to form a diamond film thereon; and

~~characterized in that~~ the power is being injected into the volume of the plasma with a peak power density of at least  $100 \text{ W/cm}^3$  while maintaining the substrate to a substrate temperature of between  $700^\circ\text{C}$  and  $1000^\circ\text{C}$ .

2. (Currently Amended) ~~Method~~—The method according to Claim 1, in which a plasma having at least one of the following features is generated near the substrate:

- the pulsed discharge has a certain peak absorbed power  $P_C$  and the ratio of the peak power to the volume of the plasma is between  $100 \text{ W/cm}^3$  and  $250 \text{ W/cm}^3$ ,
- the maximum temperature of the plasma is between  $3500 \text{ K}$  and  $5000 \text{ K}$ ,
- the temperature of the plasma in a boundary region of the plasma located less than  $1 \text{ cm}$  from the surface of the substrate is between  $1500 \text{ K}$  and  $3000 \text{ K}$  and
- the plasma contains hydrogen atoms having a maximum concentration in the plasma of between  $1.7 \times 10^{16}$  and  $5 \times 10^{17} \text{ cm}^{-3}$ .

3. (Currently Amended) ~~Method~~—The method according to Claim 1 or Claim 2, in which said gas contains carbon and hydrogen in a carbon/hydrogen molar ratio of between 1% and 12%.

4. (Currently Amended) ~~Method~~—The method according to Claim 1, in which said gas contains at least one hydro-carbon, and a plasma having a concentration of the carbon-containing radicals of between  $2 \times 10^{14} \text{ cm}^{-3}$  and  $1 \times 10^{15} \text{ cm}^{-3}$  is generated.

5. (Currently Amended) ~~Method~~—The method according to Claim 1, in which a pulsed discharge is produced, in which the ratio of the duration of the high-power state to the duration of the low-power state is between 1/9 and 1.

6. (Currently Amended) ~~Method~~—The method according to Claim 1, in which at least one of the following parameters is estimated:

- a substrate temperature,
- a temperature of the plasma,
- a temperature of the plasma in said boundary region, located less than 1 cm from the surface of the substrate,
- a concentration of atomic hydrogen in the plasma,
- a concentration of carbon-containing radicals in the plasma,
- a concentration of carbon-containing radicals in said boundary region close to the plasma,
- a pressure of the plasma and
- a power density of the plasma,

and the power emitted as a function of time is adapted according to at least one of these parameters.

7. (Currently Amended) ~~Method~~—The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

- the pulsed discharge has a peak power of at least 5 kW at 2.45 GHz,
- the pressure of the plasma is between 100 mbar and 350 mbar and
- the gas containing hydrogen and carbon is emitted with a ratio of the flow rate to the volume of plasma of between 0.75 and 7.5 sccm/cm<sup>3</sup>.

8. (Currently Amended) ~~Method~~—The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

- the pulsed discharge has a peak power of at least 10 kW at 915 MHz,
- the pressure of the plasma is between 100 mbar and 350 mbar and
- the gas containing hydrogen and carbon is emitted with a ratio of the flow rate to the volume of the plasma of between 0.75 and 7.5 sccm/cm<sup>3</sup>.